MthSc 440 **Problem Set #2** Spring 2004

Due January 29, 2004

1. Acme Truck Company manufactures two types of trucks, the Safari and the Rover. Every Safari produced contributes $390 to profit, while each Rover contributes $430 to profit. Each truck must go through the assembly and the painting shops. If the assembly shop were entirely devoted to assembling Safari engines, then 850 Safari engines per day could be assembled, while if the assembly shop were completely devoted to assembling Rover engines, then 680 Rover engines per day could be assembled. Also if the paint shop were entirely devoted to painting Safaris, then 800 Safaris could be painted per day, while if the paint shop were completely devoted to Rovers, then 700 Rovers could be painted per day. Finally the manufacturing facility has available 2900 tires per day. Each Rover requires 4 tires, whereas each Safari requires 5 tires (including a spare). Formulate a linear programming problem for optimally operating the Acme facility. Clearly define your decision variables (with appropriate units).

2. Ignizio and Cavalier, Problem 3.13. Also graph the feasible region and clearly label the extreme points. Express (3,4) as a convex combination of the extreme points.

3. Consider the following linear programming problem:

$$
\begin{array}{llrcrcl}
\text{maximize} & z = & 3x_1 & + & 5x_2 & & \\
\text{subject to} & & x_1 & + & x_2 & \leq & 6 \\
 & & -\,x_1 & + & x_2 & \leq & 2 \\
 & & -2x_1 & + & x_2 & \leq & 1 \\
 & & & & x_1\,,\, x_2 & \geq & 0
\end{array}
$$

(a) Carefully graph and label the feasible region. For each extreme point, indicate the intersecting lines defining it. Determine the exact fractional coordinates of each extreme point, expressed algebraically as $\mathbf{x} = (x_1, \ldots, x_5)$, and indicate which variables are basic/nonbasic.

(b) Identify on your graph the basic, but infeasible, points $\mathbf{x}$ and also give their exact fractional coordinates $\mathbf{x} = (x_1, \ldots, x_5)$.

(c) Solve this linear program by evaluating the objective function at each extreme point.

(d) Solve this linear program by the graphical method.